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Bureau of Land Management
Northeastern States District Office
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Environmental Assessment

NEPA #: DOI-BLM-Eastern States-0030-2017-0009-EA

EOIs 1457, 1459 & 1465/1514

Date:	August 2018
Type of Action:	Oil and Gas Leasing
Location:	U.S. Forest Service lands and non-Forest Service lands within the proclamation boundary of the Huron-Manistee National Forest in Muskegon County, Michigan. See Appendix A for specific parcels.
Acreage:	3,757.60 acres

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MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

Acronyms

APD - Application for Permit to Drill
BLM - Bureau of Land Management
BMP - Best Management Practice
CAA - Clean Air Act
CCS - Carbon Capture Sequestration
CERCLA - Comprehensive Environmental Response Compensation and Liability Act
CFR - Code of Federal Regulations
CH_4 - Methane
CO - Carbon Monoxide
CO_2 - Carbon Dioxide
CO_2e - Carbon Dioxide Equivalent
COA - Conditions of Approval
CWA - Clean Water Act
EA - Environmental Assessment
EO - Executive Order
EOI - Expression of Interest
EPA - Environmental Protection Agency
ESA - Endangered Species Act
GHG - Greenhouse Gas
HUC - Hydraulic Unit Code
NEPA - National Environmental Policy Act
NHPA - National Historic Preservation Act
NO_x - Nitrogen Oxides
RCRA - Resource Conservation and Recovery Act
RFDS - Reasonably Foreseeable Development Scenario
VOC - Volatile Organic Compound

Contents

1. Introduction: Purpose of and Need for Action

1.1. Background

The Bureau of Land Management (BLM) Northeastern States District has received Expressions of Interest (EOIs) to lease approximately 3,757 acres of federal mineral estate for oil and gas development located within Muskegon County, Michigan. Of this nominated acreage, approximately 3,717 acres of federal mineral estate underlies Huron-Manistee National Forest (HMNF) lands and 40 acres of federal mineral estate underlies private land. Maps of the nominated parcels can be found in Appendix B.

The proposed nominations, if approved, would be offered at a competitive lease sale with stipulations and notices generated through this environmental analysis process, and, for the acres within Forest Service land, those formulated through the development of the 2006 HMNF Land and Resource Management Plan (LRMP), more commonly referred to as the 2006 Forest Plan. Issuance of competitive leases would give the lessee(s) exclusive rights to explore and develop Federal oil and gas minerals but would not authorize surface-disturbing activities or obligate the company to drill a well on the lease. A lease may be used to consolidate acreage to meet well spacing requirements. A lease may also be acquired for speculative value. Once a lease is awarded, the lessee would have ten years to conduct oil and gas exploration. However, before any ground disturbance is authorized, the lessee is required to submit an approved Application for Permit to Drill (APD) to the BLM (see Chapter 2.2.1 for more information on APDs).

1.2. Need for Proposed Action

The need for the Proposed Action is established by the BLM's responsibility under Onshore Order No. 1, pursuant to the authority of the Mineral Leasing Act of 1920, as amended (30 United States Code [USC] 181 et seq.), the Federal Land Policy and Management Act of 1976 (FLPMA), and the Energy Policy Act of 2005, to make mineral resources available for development to meet national, regional, and local needs. The oil and gas leasing program managed by the BLM encourages the sustainable development of domestic oil and gas reserves that reduce the dependence of the United States on foreign sources of energy as part of its multiple-use and sustainable yield mandate.

1.3. Purpose of the Proposed Action

The purpose of the Proposed Action is to support the development of oil and natural gas resources that are essential to meeting the nation's future needs for energy while minimizing adverse effects to natural and cultural resources. The BLM minimizes adverse effects to resources by identifying appropriate lease stipulations and notices, best management practices, and mitigations. It is the policy of the BLM as mandated by various laws, including the Mineral Leasing Act of 1920, as amended (30 United States Code [USC] 181 et seq.), the Federal Land Policy and Management Act of 1976 (FLPMA), and the Energy Policy Act of 2005 to make Federal mineral resources available for development to meet national, regional, and local needs.

1.4. Relationship to Statutes, Regulations, and Other Environmental Analyses

In addressing environmental considerations of the Proposed Action, the BLM is guided by relevant statutes (and their implementing regulations) and Executive Orders that establish standards and provide guidance on environmental and natural resources management and planning. These include but are not limited to the following:

- National Environmental Policy Act (NEPA) of 1969 and the associated Council on Environmental Quality regulations at 43 CFR Parts 1500-1508
- Federal Land Policy and Management Act (FLPMA) of 1976 (43 U.S.C. 1701 t seq., as amended)
- Mineral Leasing Act (MLA) of 1920 (30 U.S.C. 181-263, as amended)
- National Historic Preservation Act (NHPA) of 1966 (54 U.S.C. 300101 et seq.)
- American Indian Religious Freedom Act (1978);
- Native American Graves Protection and Repatriation Act (NAGPRA) (1990);
- Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.)
- Clean Water Act of 1972 (33 U.S.C. 1251 et seq.)
- Clean Air Act of 1970 (42 U.S.C. 7401 et seq.)
- Federal Onshore Oil and Gas Leasing Reform Act (FOOGLRA) of 1987 (43 CFR 3162)
- Migratory Bird Treaty Act (MBTA) of 1918
- Resource Conservation and Recovery Act (RCRA) (1976) as amended;
- Executive Order (EO) 11988 - Floodplain Management;
- EO 11990 - Protection of Wetlands;

- EO 12898 (59 FR 7629) (1994) Environmental Justice in Minority Populations and Low-Income Populations
- EO 13045 - Protection of Children from Environmental Health and Safety Risks;
- EO 13007 - Indian Sacred Sites.

In addition to the above statutes and regulations, the following BLM and Forest Service policies are applicable to oil and gas leasing:

- Memorandum of Understanding between the USDOI BLM and USDA Forest Service Concerning Oil and Gas Leasing and Operations (Forest Service Agreement No. 06-SU-11132428-052; BLM MOU WO300-2006-07) for EOIs 1457 and 1459;
- Memorandum of Understanding between the USDA Forest Service, Southern and Eastern Regions and USDOI BLM, Eastern States Concerning Oil and Gas Lease Sales and Operations on National Forest System Land (2016) for EOIs 1457 and 1459; and
- Updating Oil and Gas Leasing Reform – Land Use Planning and Lease Parcel Reviews (BLM WO IM 2018-034) for EOI 1465/1514.

The Proposed Action and alternatives, as applied to EOIs 1457 and 1459, are in conformance with the 2006 Forest Plan (U.S. Forest Service, 2006). Under the 2006 Forest Plan, 969,727 acres of federally owned surface would be available for mineral leasing (Record of Decision 2006 Forest Plan, p. 12). The BLM was a cooperating agency in development of the 2006 Forest Plan and its related Final Environmental Impact Statement (2006 Forest Plan Final EIS) (U.S. Forest Service, 2006). The Forest Service signed its Record of Decision on March 20, 2006.

The Proposed Action and alternatives, as applied to EOIs 1465/1514, are in conformance with the BLM *Michigan Resource Management Plan* (Michigan RMP) (BLM, 1985). Section II, Minerals Development, number 1 of the Michigan RMP states, “All Federal mineral ownership is available for exploration and development except where legal restrictions, intergovernmental consistency requirements, administrative or Congressional designations, or surface resource sensitivity prohibit such activities” (p. 3).

1.5. Decision to Be Made

The decision to be made is whether to offer the Federal oil and gas mineral estate (as described in Appendix A) in Muskegon County for competitive leasing. BLM policy is to

promote oil and gas development if it meets the guidelines and regulations set forth by the NEPA and other subsequent laws and policies passed by the U.S. Congress.

1.6. Issues to Focus On

The BLM conducted internal scoping through interdisciplinary team meetings and informal discussions. BLM specialists conducted external scoping by site visit to the analysis area on August 10, 2017, through discussions with USFS personnel, and through consultations with six federally-recognized tribes, the U.S. Fish and Wildlife Service (FWS), and Michigan State Historic Preservation Office (SHPO). The results of these consultations can be found in Chapter 3 of this EA.

Through scoping, the BLM became aware of several issues that pertain to oil and gas drilling, especially in this geographical area, including air and water quality, noise, and surface disturbance. The BLM also gathered information about potential issues from *Hydraulic Fracturing in Michigan, Integrated Assessment Final Report* (University of Michigan, 2015) and from the Forest Plan. Issues are as follows:

1. Oil and gas site development and production activities produce dust, emissions, and odors that may affect people living or recreating near well sites.
2. Hydraulic fracturing operations may cause elevated levels of methane or other chemicals in groundwater.
3. Portions of the Muskegon River were listed as impaired waters under the Clean Water Act, and some oil and gas activities may contribute to the contamination that has caused these effects.
4. High-volume hydraulic fracturing operations, which use hundreds of thousands to millions of gallons of water, may result in depleted groundwater or surface water resources, which may have negative consequences for drinking water quality or aquatic habitat.

2. Proposed Action and Alternative

2.1. No-Action Alternative

Under the No Action Alternative, the BLM would not offer federal minerals within the analysis area for oil and gas leasing. Without a lease (No Action Alternative), operators would not be authorized to access federal minerals for development. Therefore, not

leasing the parcels would not meet the purpose of and need for the Proposed Action. However, the No Action Alternative has been retained for analysis in this EA to serve as a baseline for comparing the potential impacts of the Proposed Action.

2.2. Proposed Action

The Bureau of Land Management (BLM) proposes to make available for lease up to approximately 3,757 acres of federally-owned mineral estate located within Muskegon County, Michigan. The locations of the areas that have been requested at this time, through EOIs, are listed in Appendix A. This EA summarizes the BLM's analysis of potential environmental impacts from leasing and future development of Federal minerals within these watersheds:

- 040601010707 -- Skeel Creek-South Branch White River
- 040601010901 -- Sand Creek-White River
- 040601010902 -- Carlton Creek
- 040601010903 -- Pierson Drain
- 040601010904 -- White Lake-White River
- 040601011004 -- Bigsbie Lake-Frontal Lake Michigan
- 040601011008 -- Duck Creek
- 040601011009 -- Little Black Creek-Frontal Lake Michigan
- 040601020905 -- Brooks Creek
- 040601020906 -- Minnie Creek-Muskegon River
- 040601021001 -- Cedar Creek
- 040601021002 -- Mosquito Creek-Muskegon River
- 040601021003 -- Bear Creek
- 040601021004 -- Muskegon Lake-Muskegon River

A federal oil and gas lease is a legal contract that grants exclusive rights to the lessee to develop federally-owned oil and gas resources but does not authorize surface-disturbing activities or obligate the lessee to drill a well on the parcel in the future. A lessee would be required to submit an application for permit to drill (APD) before conducting any ground-disturbing activities pursuant to the lease. At that point, the BLM would conduct site-specific environmental analysis and any required consultations.

2.2.1. Connected Action: Drilling and Production

Site-Specific Applications for Permit to Drill (APDs)

In an APD, an applicant identifies a proposed drill site and provides the BLM with specific details on where, how, and when the applicant proposes to drill the well within the constraints of the lease document. Upon receipt of an APD, the BLM conducts an onsite inspection with the applicant and, if possible, the private landowner or the surface-managing agency. Requirements under the NEPA, the Endangered Species Act, and other applicable laws must also be met at the APD stage.

At the time of leasing, there are many factors that the BLM cannot predict concerning the connected action of drilling and production:

- whether the lessee will submit an APD, and, if so
- where the lessee will propose to drill (on private or Federal surface, in a farm field or in a woodland, etc.)
- what target formation the lessee will seek to develop
- how many wells will be drilled
- what type(s) of wells will be drilled
- how many well pads will be used

Well Drilling

The BLM developed, for the 2006 Forest Plan (Appendix D), a reasonably foreseeable development scenario (RFDS), which estimates, based on geology, forest stipulations, and other factors, how many wells would be expected to be drilled throughout the Huron Manistee National Forest over the next 10 to 15 years. The RFDS projects that 148 wells will be drilled throughout the Manistee portion of the Forest. Of these, only 86 might be drilled in the portion under consideration in this EA, since 62 of those wells are predicted to be drilled in areas outside of Muskegon County or the watersheds under consideration here. These 86 wells were predicted to be drilled throughout several counties, meaning that the likely number of wells to be drilled in the current analysis area would be a fraction of 86 wells. In reality, only 11 of the estimated 148 wells have been drilled on the entire Huron Manistee National Forest since 2006.

Oil and gas (hydrocarbon) wells are built in two phases – drilling and completion. Wells may be drilled vertically to reach a bottom-hole location that is directly below the pad, directionally to reach an offset location, or horizontally to maximize the length of the production zone in a horizontal geologic formation. Land is cleared for roads, drilling

pads, pits for storing fresh water, various accessory facilities, and pipelines. Drilling operations continue around the clock, and wells may be drilled in as little as two days.

If the well is determined to be capable of producing in sufficient quantity to justify the expense, then the well would be completed as a producing well. A completed well may have a pump jack (for oil), a power source, and piping to storage tanks. A completed well may also require treatment facilities to separate the water from the oil.

Production, Abandonment, and Reclamation

Production would continue for as long as the well is providing economically sufficient quantities of hydrocarbons. During the production phase the well may undergo maintenance, repairs or replacement of surface equipment. The well may be maintained or cleaned periodically using a smaller drilling rig. If production decreases, the leaseholder or operator may decide to utilize downhole enhancements or stimulation techniques to restore or improve production levels. Formation water production, along with the oil and/or gas, is expected during the productive life of the well, and separation, dehydration and other production processing may be necessary. This processing may require construction of temporary facilities, both on- and off-site. Oil or gas field fluid wastes may be disposed into state of Michigan approved Class II underground injection wells, in accordance with state and federal regulations

After production ceases or is no longer profitable, the well would be abandoned, which would include the following operations: surface equipment removal, plugging and abandoning drill holes and wells, and surface rehabilitation. All surface disturbances must be reclaimed to USFS standards on National Forest System lands and to state of Michigan and BLM standards on private lands as agreed to by the surface owner.

2.3. Alternatives Considered, but Eliminated from Further Analysis

No other alternatives to the proposed action were apparent that would meet the purpose of and need for the Proposed Action.

3. Environmental Setting and Effects

The discussion in this chapter focuses on the relevant resources and issues and therefore, only those elements of the affected environment that have the potential to be affected are described in detail. Based on a review of the context and scale of the Proposed Action, Table 1 lists the resources discussed in detail in this EA:

Table 1. Resources Considered

Resource(s)	Not Present	Present, Not Affected	Present, Potentially Affected	Rationale
Air Resources			X	See Chapter 3.1
Global Climate Change			X	See Chapter 3.1
Areas of Critical Environmental Concern	X			No ACECs within the analysis area.
Coastal Zones	X			The nominated parcels are outside of Michigan's coastal zone.
Cultural Resources and Paleontology			X	See Chapter 3.7
Native American Religious Concerns			X	See Chapter 3.8
Environmental Justice			X	See Chapter 3.9
Fire and Fuels	X			
Floodplains		X		Stipulations will prohibit development that may adversely impact floodplains.
Forests			X	See Chapter 3.3.1
Geology and Mineral Resources			X	See Chapter 3.4
Soils			X	See Chapter 3.5
Grazing and Range Management	X			
Lands with Wilderness Characteristics	X			
Wilderness	X			
Noise and Odor			X	See Chapter 3.12

Resource(s)	Not Present	Present, Not Affected	Present, Potentially Affected	Rationale
Prime or Unique Farmlands	X			
Recreation			X	See Chapter 3.11
Socioeconomics			X	See Chapter 3.11
Transportation and Access			X	See Chapter 3.11
Vegetation Resources ● Threatened and Endangered Species ● Noxious and Invasive Species			X	See Chapter 3.3.1
Visual Resources			X	See Chapter 3.9
Wastes, Hazardous and Solid			X	See Chapter 3.6
Water Resources ● Quality ● Quantity ● Riparian Zones ● Wetlands			X	See Chapter 3.2
Wildlife Resources ● Threatened and Endangered Species ● Migratory Birds ● Fish Habitat			X	See Chapter 3.3.2
Wild and Scenic Rivers	X			*Wild & Scenic Study Management Area* includes a river or rivers that are under consideration as potential Wild and Scenic Rivers, but they are not protected to the same degree as WSRs until they are officially designated.

3.1. Air Emissions

Environmental Setting

Air quality impacts from oil and gas production were analyzed in the development of the 2006 Forest Plan. The various components of production, including land clearing, motor vehicle use, drilling, well completion, and production, all produce various air pollutants. These include the following:

Volatile Organic Compounds. The U.S. EPA (EPA) has classified 187 compounds as hazardous air pollutants (HAPs), which are chemicals that are known to cause cancer or other serious health problems in people. Many, but not all, of these compounds are volatile organic compounds (VOCs), which are carbon-based molecules that readily become vapors in the atmosphere, allowing them to spread rapidly. Several of these VOCs, including formaldehyde, benzene, toluene, ethylbenzene, xylene isomers, and normal-hexane (n-hexane), are associated with the oil and gas industry. For the most part, these are also the compounds that cause odors that may be detectable, as described in the 2006 Forest Plan, up to one-quarter mile away from an oil and gas site. These compounds are harmful to human health and create annoying odors that may be detected by people living near oil and gas sites or recreating in the national forest.

Particulate Matter. Particulate matter consists of particles that are small enough to be inhaled deep into human lungs, where they cause serious health problems. They are categorized as inhalable particles that are smaller than 10µm (PM_{10}) and *fine* inhalable particles that are smaller than 2.5µm ($PM_{2.5}$). Oil and gas development activities produce particulate matter in two ways. First, activities directly produce or emit dust. This occurs, for example, when vehicles drive on unpaved roads and kick up dust and when diesel engines are used for driving trucks or drills, pumps, and other onsite machinery. The second source, which is also the most abundant source of particulate matter, is the generation of particulate matter through complex chemical reactions involving nitrogen oxides (NO_x), sulfur dioxide (SO_2), and other chemicals, which are emitted by fossil fuel combustion.

Ozone. A related air quality impact from fossil fuel combustion is the production of ground-level ozone, which is produced by chemical reactions involving VOCs and NO_x, both of which are emitted by diesel and gasoline engines. When the Forest Plan was drafted, Muskegon County had elevated ozone levels. Most of this ozone was produced in urban areas far away from the Huron-Manistee National Forest and transported by wind. The area is currently in attainment, meaning that ground-level ozone is below the level set by the EPA under the Clean Air Act.

Hydrogen Sulfide. Hydrogen sulfide (H_2S) is a naturally-occurring component in some geologic formations and may be inadvertently vented to the atmosphere by oil and gas activities. Sour gas, as it is called, smells like rotten eggs and is lethal in small doses. The Forest Plan prohibits venting sour gas and requires that it be burned, incinerated, or injected into a deep geologic formation.

Environmental Effects

There would be no direct effects to air quality from issuing oil and gas leases, since leasing does not authorize oil and gas drilling or other development. Potential effects may result from future development and production operations. The primary issue raised pertaining to oil and gas production in and around the HMNF is that oil and gas sites will produce odors that will detract from the quality of life for nearby residents or from the recreational experiences of visitors to the HMNF. These odors would be produced primarily by VOCs. Odors would be produced most heavily during drilling and completion, when industrial chemicals are present on the well pad and are being forced down the borehole to complete the well. During this period, these VOCs may be emitted from the borehole and from the tanks and pipes that contain and convey them. As stated in the Forest Plan, these odors may be detectable at distances up to one-quarter mile. This distance depends on weather, well depth, geology of the target formation, technology being used in the well completion, and other factors.

Since it is expected that oil and gas producers will prefer to construct pads on private lands, it is also reasonable to expect that there will be residents who live near enough to the pads to smell the odors produced during drilling and completion. Recreational users of the national forest may also smell emissions from oil and gas sites. This would be, most likely, a lesser impact than the effects to nearby residents for two reasons. First, the analysis area contains only motorized trails. Trail users in this area are generally moving quickly enough that they would enter and exit the affected area in minutes or even seconds. Second, snowmobile or ATV operators would be operating machines that are producing their own odors from internal combustion, sometimes two-cycle, engines, making them less sensitive to the odors produced by oil and gas activities.

State permits, Forest Plan stipulations, and BLM policies are designed to minimize emissions using Best Management Practices (BMPs). The Michigan Department of Environmental Quality (MDEQ) is responsible for enforcing compliance with air quality regulations under the Clean Air Act. The MDEQ requires operators of oil and gas facilities to obtain permits to account for and control emissions of the pollutants described above. Certain sources that are expected to produce minimal emissions, such as

crude storage tanks that have vapor recovery systems, are exempted from the permitting requirements. Facilities that will produce less than 100 tons per year (TPY) of a pollutant are considered minor sources and are regulated less strictly than major sources, which are required to use the best available technologies for reducing emissions. These permitting requirements are targeted toward maintaining good air quality in attainment areas and improving air quality in areas that are not in attainment.

The MDEQ regulates emissions sources differently depending on the current, local air quality. If the area is in compliance, or *in attainment*, with the National Ambient Air Quality Standards (NAAQS), then new emissions sources are subject to the Prevention of Significant Deterioration (PSD) standards, which are a set of incremental increases in regional emissions that are permissible while still keeping the area in attainment.

Since the main goal of the PSD program is to maintain good *regional* air quality, which is typically determined over a period of a year or more, it is still possible for a permitted minor source to produce odors that persist for a time in a small geographic area. The potency and duration of odors at a particular location, such as a house or a recreational trail near a well site, will depend on various factors, such as the geologic formation, the immediate weather conditions, and the types and quality of equipment being used.

The 2006 Forest Plan stipulates that all H_2S emissions must be burned, incinerated, or injected into a deep geologic formation, which will prevent this chemical's rotten-egg smell from being present to a level that can produce persistent odors at nearby residences. Further, the BLM is a party to a memorandum of understanding with the U.S. Department of Agriculture and the EPA that states that the EPA will conduct air quality modeling for actions that meet certain emissions or geographic criteria (USDA, USDOI, & USEPA, 2011):

- creation of a substantial increase in emissions
- material contribution to potential adverse cumulative air quality impacts
- Class I or sensitive Class II Area
- non-attainment or maintenance area
- area expected to exceed NAAQS or PSD increment

Nordhouse Dunes Wilderness, the nearest Class I Area to the proposed leases, is more than 50 miles to the north, and the analysis area does not contain any sensitive Class II Areas.

The 2006 Forest Plan Final EIS predicts that overall air quality throughout the HMNF will remain good as a result of the expected level of oil and gas development. Given that

only 11 wells were drilled throughout the HMNF in the past ten years, which is far below the predicted rate of development, this is still the expected impact to air quality. Impacts to air quality are expected to be low enough that no parts of Michigan would fall into non-attainment.

Cumulative impacts to homeowners and recreational users experiencing short-term increases in VOCs, particulate matter, and odors are expected to be the same as the direct impacts. The Forest expects to be conducting red pine management, including thinning and regeneration, beginning in 2019. This activity may generate dust, depending on the time of year and weather conditions of the proposed forestry activities. Well spacing requirements in Michigan are designed to prevent the same location from being continuously or repeatedly exposed to the same pollutants. Additional wells in the area would be drilled far enough away from the same location that their emissions would be naturally dispersed to below unaided human detection levels at any given residence previously impacted by drilling.

Greenhouse Gases. A second air quality-related issue regarding potential oil and gas development is that emissions of greenhouse gases will contribute to global climate change. Greenhouse gases (GHGs) are compounds that trap energy from the sun by reflecting it back toward the earth's surface, causing a greenhouse effect. Gases emitted by oil and gas operations include CO_2, methane, and several VOCs. The most abundant GHG emissions from oil and gas operations are CO_2 and methane. CO_2 is emitted by the combustion of fossil fuels in engines. Methane is emitted by well drilling and completion and throughout the productive life of a well, which may be 30 to 40 years. The sources of this methane include the well itself, as methane in the targeted formation escapes up the well bore and into the atmosphere, as well as various pumps, valves, and infrastructure that convey methane to be captured or that use pressurized methane to drive machinery. During well completion, as fluids are being forced down a bore, methane from the formation escapes from the borehole as well as from the many pipes, valves, pumps, and other structures that are used in the process. Whether a well is producing primarily oil or gas, pipes, valves, tanks, and other structures that are used to store and convey those products leak methane into the atmosphere.

Different GHGs are more or less important than one another with respect to climate change. This is because they persist in the atmosphere for varying durations and trap energy more or less effectively than one another. Methane is a far more potent GHG than CO_2. Because of this disparity, all GHG emissions are normalized to a unit called CO_2-equivalent (CO_2e).

Through the Greenhouse Gas Reporting Program (USEPA, 2017), the EPA tracks emissions from various industrial sectors, including petroleum and natural gas systems. Since 2011, onshore oil and gas production has emitted between 85 and 105 million metric tons of CO_2e. Onshore production accounts for almost half of GHG emissions within petroleum and natural gas sector, which includes also offshore production, natural gas processing, transmission, storage, and liquid natural gas. All emissions from the petroleum and natural gas sector in 2016 accounted for about ten percent of all the emissions reported to the GHGRP. Production in the Michigan Basin emitted between 500,000 and 1,500,000 metric tons CO_2e (between 0.6 percent and 1.8 percent of total GHG emissions from the onshore production subsector) in 2016.

There are many uncertainties in the process of estimating GHG emissions, the most important being, perhaps, whether a well is conventional or unconventional, since the length of the well and the use of high-volume hydraulic fracturing affect the resulting GHG emissions by a factor of hundreds. Since the proposed leases have the potential for either vertical or horizontal drilling, GHG emissions from development could vary widely.

Methane emissions from the completion of one unconventional (horizontal) well were estimated by the EPA to be 177 tons (USEPA, 2010), and a more recent study estimated this to be from 26 to 1,000 tons (Jiang, et al., 2011). The EPA estimated methane emissions from the completion of one conventional (vertical) well at 0.17 tons.

The EPA, under New Source Performance Standards (NSPS) issued in 2016, requires that operators of most hydraulically fractured wells capture methane and VOCs from the well completion process, separate the methane, and deliver it to a market, producing a reduction in methane emissions from well completions of up to 95 percent. The NSPS rule also requires that operators submit and follow a leak monitoring plan to reduce *fugitive* emissions -- those emissions that result from leaks.

The EPA Natural Gas STAR Program (USEPA, 2018b) is a voluntary program that identifies sources of fugitive methane sources and seeks to minimize fugitive CH_4 through careful tuning of existing equipment and technology upgrades. Data provided by STAR show that some of the largest air emissions in the natural gas industry occur as natural gas wells are fractured and are being prepared for production.

3.2. Groundwater and Surface Water Quality

Environmental Setting

The processes of drilling and completing a well involve the use of many different types of chemicals, including acids, VOCs, salts, alcohols, and water. During the completion and production phases of a well, fluids containing these chemicals as well as naturally occurring hydrocarbons, salts, radioactive compounds, and heavy metals return to the surface and must be disposed of. Drilling to a production zone that is below a potable water-bearing formation poses the risk of allowing brine and other chemicals to migrate up into a potable water zone. Some studies have detected elevated levels of methane or other chemicals in drinking water from wells near oil and gas sites (New York State Department of Environmental Conservation, 2009). Another potential risk posed by hydraulic fracturing is the possibility that fluids under high pressure could migrate to an existing well that was improperly abandoned, which would enable those fluids to migrate to the surface and contaminate any formations that the old well penetrates. This phenomenon is called well communication and poses a low risk in the analysis area because wells in this area have been well-documented.

The analysis area contains approximately 10,000 household wells, most of which are less than 100 feet deep. About 1,000 of these are household wells within a mile of the EOIs under consideration.

The potential for fluids to migrate from the hydraulic fracture zone is considered very low, because of the thousands of feet separating the likely production formations, which mainly consist of rocks of very low permeability, such as shale. Finally, the BLM, under Onshore Oil and Gas Order Number 2, and the MDEQ require the use of casing and cementing to isolate the well from any potentially drinkable water-bearing formations. Michigan's R324.408 requires surface casing to be set 100 feet below the base of glacial drift into competent bedrock and 100 feet below all freshwater strata.

Environmental Effects

There would be no direct effects to water resources or water quality from issuing oil and gas leases, since leasing does not authorize oil and gas drilling or other development. Potential effects may result from future development and production operations. Well drilling and completion use hundreds of thousands of gallons or, in the case of high-volume hydraulic fracturing, several million gallons of water. The glacial drift throughout most of the analysis area forms an unconfined aquifer. Baseflow in area streams ranges

from almost zero to 2,160 cubic feet per second (cfs). Since the location, well type, water source, and method of conveying water to the pad are all as of yet unknown, the BLM cannot analyze the expected impacts to a particular water source. Obtaining water from a separate area and trucking it to a site is a common practice and could be used in this situation. All new proposed water withdrawals in Michigan are required to be screened using the Water Withdrawal Assessment Tool, which is a computer model that is designed to predict whether a withdrawal will adversely affect water resources and aquatic ecosystems. Therefore, it is expected that water withdrawal would not adversely affect aquatic ecosystems or water supplies.

3.3. Plant and Animal Habitat and Populations

The Proposed Action would have no direct impacts on plant and animal habitat and populations, since a lease would not authorize any surface-disturbing activities. This section describes potential effects that may result from reasonably foreseeable future development of lease parcels. The primary effect to plants and animals from oil and gas development would be habitat modification from land clearing, grading, and reclamation. While contamination of water, soil, and air may affect wildlife, those effects are not discussed in detail in these sections, since they are covered in those relevant sections.

3.3.1. Vegetation

Environmental Setting

The primary vegetation type across the Rural Management Area, which is defined in the 2006 Forest Plan and which occupies most of the analysis area, is pine forest, and the primary vegetation type within the Wild and Scenic Study Management Area is floodplain forest. The Rural Management Area throughout the entire HMNF includes 6,900 acres of designated old growth. Within the analysis area, there are 1,925 acres of open habitat, consisting of 292 stands, with none larger than 217 acres. The private lands that are scattered among the Forest lands include many openings used for agriculture, borrow pits, roads, and old fields. The private parcel in EOI 1465/1514 is mostly open water and open wetland.

Environmental Effects

Construction of well pads, roads, pipelines, and other infrastructure may result in the clearing of land. If these items are located in areas that are already cleared, such as agricultural fields, then less space will need to be cleared. This is likely, since operators

tend to locate well pads on private lands, which are frequently open in the Rural Management Area and in the surrounding private lands, both of which contain abundant utility corridors.

Standards and guidelines in the 2006 Forest Plan are designed to establish and maintain a mix of cover types that is appropriate to each management area. These are listed in Appendix C. For development that occurs on private lands, the landowner would determine what lands may be used and cleared. On National Forest System lands, disturbed areas must be revegetated within one year.

Construction of roads, well pads, pipelines, and other structures associated with potential future oil and gas development can spread invasive species and/or noxious weeds in two general ways. First, increased vehicle traffic may carry seeds, plant parts, or other live organisms that may become established within the proposed lease area. This could introduce new species from outside the proposed lease area, and could result in them spreading from one area to another. The risk of such propagation is affected by the size of the disturbed area, the volume of vehicle traffic, and the abundance of invasive species already present. Areas that are disturbed by well pads or other development would be susceptible to direct infestation by non-native, invasive plant species that thrive in disturbed conditions. However, some of these species, such as garlic mustard (*Alliaria petiolata*), a biennial plant that spreads by abundant seed production, are able to propagate into undisturbed areas, and large areas of undisturbed habitat could be indirectly affected. Therefore, it is possible that far more than the directly-disturbed area of land could be infested by non-native, invasive plant species.

The second way that oil and gas development may result in the propagation of invasive species is by creating open corridors and forest edges that are highly susceptible to edge-loving species. Where the forest canopy is broken, invasive species that thrive in sunny conditions may be introduced into the newly cleared area and quickly populate areas of disturbed soil.

These impacts are minimized in activities on the national forest through requirements to clean vehicles and equipment before bringing them onto the Forest. Also, oil and gas activities are required to disturb the minimum area necessary and to revegetate sites as required by the federal or private landowner.

3.3.2. Wildlife

Environmental Setting

The lands in EOIs 1457 and 1459 are dominated by coniferous and mixed woodlands. Habitat in EOI 1465/1514 consists of water and wetland/marshlands on the south side of Duck Lake. No BLM-sensitive species exist within the Northeastern States District.

Threatened and Endangered Species

Utilizing geospatial information, the BLM consulted with the FWS through their Information for Planning and Consultation (IPaC) website on March 7, 2018 for an official species list. The following species are likely present in the proposed parcels:

Table 2. Threatened and Endangered Species Within Analysis Area

Species: Indiana Bat (*Myotis sodalis*)	**Status:** Endangered
Habitat and General Information: Indiana bats are known to exist along the west coast of Michigan, with a majority of them believed to hibernate in adjacent states. These bats have a strong fidelity to their summer home. Suitable summer habitat consists of a wide variety of forest/wooded habitats where they roost, forage and travel including some adjacent and interspersed non-forested habitats. Potential roost sites consist of live trees and snags ≥5 inches diameter at breast height (DBH) that have exfoliating bark or cracks/crevices, as well as linear features such as fencerows, riparian forest, and other wooded corridors. May be dense or loose aggregates of trees with variable canopy. Indiana bats are not found to frequent human-made structures. Potential habitat exists within all proposed parcels.	
Species: Northern Long-eared Bat (*Myotis septentrionalis*)	**Status:** Threatened
Habitat and General Information: Northern Long-eared Bats (NLEB) are believed to range throughout Michigan. They tend to hibernate in mines, caves or similar structures. Suitable summer habitat consists of forested habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats. Potential roost trees are live trees and snags ≥3 inches DBH that have exfoliating bark, cracks, crevices and /or cavities, as well as linear features such as fencerows, riparian forests, and other wooded corridors. These areas may be dense or loose aggregates of trees with variable canopy. NLEB have been observed roosting in human-made structures, such as buildings, barns, bridges, and bat boxes. Potential Habitat exists within all proposed parcels.	
Species: Karner Blue Butterfly (*Lycaeides Melissa samuelis*)	**Status:** Endangered
Habitat and General Information: Karner blue butterfly habitat consists of Pine barrens and oak savannas on sandy soils and containing wild lupines (*Lupinus perennis*), the only known food plant of larvae. The range of Karners and lupine do not completely overlap. Instead, Karners are found along the northern band of lupine range. Potential habitat exist within the HMNF EOI's 1457 and 1459 and likely on suitable adjacent lands. State and federal wetland protections will prevent wetland filling activities that may otherwise adversely affect butterflies on EOI 1465/1514 or on other private surface. Private surface is likely not managed for Karner blue butterfly habitat.	

Species: Eastern Massasauga (*Sistrurus catenatus catenatus)*	**Status:** Threatened
Habitat and General Information: "Eastern Massasaugas have been found in a variety of wetland habitats. Populations in southern Michigan are typically associated with open wetlands, particularly prairie fens, while those in northern Michigan are known from open wetlands and lowland coniferous forests, such as cedar swamps. Some populations of Eastern Massasaugas also utilize open uplands and/or forest openings for foraging, basking, gestation and parturition (i.e., giving birth to young). Massasauga habitats generally appear to be characterized by the following: (1) open, sunny areas intermixed with shaded areas, presumably for thermoregulation; (2) presence of the water table near the surface for hibernation; and (3) variable elevations between adjoining lowland and upland habitats." From Michigan Natural Features Inventory (Website: mnfi.anr.msu.edu). None of the proposed parcels on the HMNF (EOI 1457 and 1459) is within Eastern Massasauga habitat and should have no effect on the species. Private parcel 1465/1514 occupies water and wetland/marshlands on the south side of Duck Lake and may be in potential EMR habitat. State and federal wetland protections will prevent wetland activities that would otherwise adversely affect wetland-dependent wildlife.	

Three additional species – piping plover, red knot, and Pitcher's thistle – are not present in the proposed parcels, since their habitats are Great Lakes shorelines and dunes.

Migratory Birds

A list of migratory birds of concern was provided by the FWS in addition to the official list of Threatened and Endangered (T&E) species for this project. These species are found in Table 3 below. Other migratory birds likely frequent the proposed project areas, but the list documents only those of concern.

Table 3. Migratory Birds of Concern

Species	BCC	Seasonal Occurrence in Project Area
American Bittern	BCR	Breeds (April 1 – August 31)
American Golden Plover	Yes	Breeds elsewhere
Bald Eagle	No	Breeds (December 1 – August 31)
Black Tern	BCR	Breeds (May 15 – August 20)
Black Billed Cuckoo	Yes	Breeds (May 15 – October 10)
Bobolink	Yes	Breeds (May 20 – July 31)
Buff-breasted Sandpiper	Yes	Breeds elsewhere
Cerulean Warbler	Yes	Breeds (April 22 – July 20)
Eastern Whip-poor-will	Yes	Breeds (May 1 – August 20)
Golden Eagle	No	Breeds elsewhere
Golden-Winged Warbler	Yes	Breeds (May 1 – July 20)
Least Bittern	BCR	Breeds (August 16 – October 31)
Long-eared Owl	Yes	Breeds (March 1 – July 15)
Red-headed Woodpecker	Yes	Breeds (May 10 – September 10)
Rusty Blackbird	Yes	Breeds elsewhere
Semipalmated Sandpiper	Yes	Breeds elsewhere
Short-billed Dowitcher	Yes	Breeds elsewhere

Species	BCC	Seasonal Occurrence in Project Area
Willow Flycatcher	BCR	Breeds (May 20 – August 31)
Wood Thrush	Yes	Breeds (May 10 – August 31)

BCC – bird of conservation concern; BCR – analysis area includes all or part of a bird conservation region.

Environmental Effects

Threatened and Endangered Species

The act of leasing itself would have no effect on any of the threatened or endangered species listed. Subsequent actions associated with drilling could have some effects on some species. These potential effects are detailed in the biological assessment (BA) that the BLM provided to the FWS on May 1, 2018, pursuant to its required consultation with the FWS. This BA and the resulting concurrence of "no effect" to T&E species from the FWS are available for review in the case file at the Northeastern States District Office. The BA includes possible Conditions of Approval (COAs) that the BLM would recommend or, when it has the legal authority to do so, require for use on private surface.

Migratory Birds

The act of leasing itself would have no effect on any of the migratory birds. However, subsequent drilling actions could have an effect on some of the birds. Many of the birds listed in Table 3 would not be affected, as they are shorebirds or would not be found within the proposed EOIs on the HMNF. The National Forest staff would add COAs where appropriate to protect any migratory birds of concern.

The proposed EOI parcel (1465/1514) on private surface is located within the lake and on the south shoreline of Duck Lake. The land base for EOI 1465/1514 is mostly wetlands. This area is more likely to house some of the shorebirds listed in Table 2. The BLM will permit filling in a wetland only if the operator has obtained the necessary state and federal wetland fill permits. The BLM would recommend COAs to restrict the timing of drilling for any development proposed under EOI 1465/1514. The BLM may request the operator to conduct an inventory of bird species prior to project approval or implementation.

3.4. Geology, Mineral Resources, and Energy Production

Environmental Setting

The depositional history and geologic structure of the Michigan Basin has resulted in reserves of oil and natural gas throughout the state of Michigan. Within Muskegon County, the major hydrocarbon production zones include early Mississippian Michigan

formation and Marshall Sandstone, late Devonian Ellsworth Shale, middle Devonian Traverse Group (including the Bell shale), and Dundee Limestone, late Silurian Salina Group, and middle Silurian Niagara Group.

Oil and gas have been produced in Muskegon County since 1927. The Muskegon field continues to produce natural gas and oil from the Dundee Limestone, Traverse Group, and Antrim Shale. Early development of oil and gas fields across the state resulted in producers drilling wells as close as possible resulting in a loss of pressure and recoverable product. As a result, the State of Michigan implemented a well drilling spacing of 40 acres for all wells, with several spacing exceptions for wells developed in specific formations. In Muskegon County these spacing exceptions include 80 acres per well in the Niagaran Formation and 640 acres per well in the Glenwood and deeper formations.

Environmental Effects

There would be no direct geologic effects from issuing new oil and gas leases because leasing does not directly authorize oil and gas exploration and development activities. Potential geologic hazards may result from future development and production operations. Michigan's geology and topography result in a low risk for many geologic hazards. Natural land subsidence occurs when the ground surface collapses due to the dissolution of subsurface material creating a void. Human-induced subsidence is often a result of groundwater withdrawal and underground mining. Michigan is not in a location subject to naturally occurring earthquakes and most originate outside the state.

Human-induced earthquakes may be caused by activities such as groundwater withdrawal, waste disposal wells, and hydrocarbon production. Hydraulic fracturing may cause induced micro-seismic events that can be detected with equipment but are not felt on the surface. Human-induced seismic events that have been reported at the surface are typically a result of injection wells, which require greater fluid pressure than production wells.

3.5. Soils

Environmental Setting

Conducting a review through the Natural Resources Conservations Services (NRCS) Web Soil Survey (WSS) revealed 15 soil series within the proposed EOI areas. Most of the soils in the analysis area are sandy. The T factor is an estimate of the maximum

average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year. These soils range in T factors from 1-5 with most of the soils having a rating of 5. Soils in the area range from very poorly drained to excessively well drained.

Table 4. Soils within Project Area, Muskegon County

Map Unit Symbol	Map Unit Name	Acres in AOI	% of AOI	Erosion, T Factor	Drainage class
CovabB	Covert-Pipestone sands, 0 to 6 percent slopes	161.4	4.3%	5	Moderately Well Drained
Ga	Granby loamy sand, lake plain, 0 to 2 percent slopes	0.2	0.0%	5	Poorly Drained
Ht	Houghton muck, 0 to 1 percent slopes	30.2	0.8%	2	Very Poorly Drained
Ku	Kerston muck	228.9	6.1%	1	Very Poorly Drained
PlfaaB	Plainfield sand, 0 to 6 percent slopes	1,496.3	39.7%	5	Very Poorly Drained
PlfaaD	Plainfield sand, 6 to 18 percent slopes	1,360.3	36.1%	5	Excessively Drained
PlfaaE	Plainfield sand, 18 to 30 percent slopes	275.6	7.3%	5	Excessively Drained
PlfaaF	Plainfield sand, 30 to 60 percent slopes	75.1	2.0%	5	Excessively Drained
PpsaaA	Pipestone-Covert-Saugatuck sands, 0 to 3 percent slopes	47.6	1.3%	5	Somewhat Poorly Drained
Sa	Saranac loam	1.8	0.0%	5	Poorly Drained
Sm	Sims loam	0.7	0.0%	5	Poorly Drained
Sp	Sparta sand, 0 to 2 percent slopes	51.9	1.4%	5	Excessively Drained
Tc	Tawas and Carlisle mucks	5.7	0.2%	1	Very Poorly Drained
W	Water	30.6	0.8%	N/A	N/A
Wa	Warners muck	2.0	0.1%	1	Very Poorly Drained
Totals for Area of Interest		**3,768.2**	**100.0%**		

Source: Web Soil Survey (NRCS, 2018)

Environmental Effects

While the act of leasing federal minerals would not affect soils, subsequent exploration/development may produce short and long-term impacts by physically disturbing the soils. Direct impacts resulting from reasonably foreseeable oil and gas construction of well pads, access roads, pipelines, utility corridors and reserve pits include removal of vegetation, exposure disturbance of the soils, compaction, loss of top soil productivity through stockpiles and susceptibility to wind and water erosion where construction of these facilities are necessary.

Indirect impacts from reasonably foreseeable development such as runoff, erosion and off-site sedimentation could result from construction and operation of well sites, access roads, gas pipelines and facilities. Contamination from drilling/completion and production wastes mixed into soil or spilled on the soil surfaces could cause a long-term reduction in site productivity if not adequately identified and addressed. Contaminated soil could also potentially affect nearby surface waters if not properly contained. Some of these impacts can be reduced or avoided through proper design, construction and maintenance, and implementation of best management practices. Additionally, reclamation would restore soil conditions where they had previously been disturbed, thus lessening some of the potential longer term effects.

Under 40 CFR parts 112 and 122, an operator must maintain a Spill Prevention, Control, and Countermeasure (SPCC) plan and a Stormwater Pollution Prevention Plan (SWPPP). Both of these plans would greatly reduce the likelihood of soil contamination. Well pads, access roads, and utility corridors are typically reseeded upon the completion of drilling and completion operations to stabilize the pad for the production life of the well(s). Vegetative growth and graveling or compacting of traveled surfaces of the pad would greatly reduce and mitigate further impacts of wind and water erosion from any location.

Although the Proposed Action of leasing the parcels would not result in any direct changes to soil, potential reasonably foreseeable mineral development could affect this resource and could contribute incrementally to it in the future. The 2006 Forest Plan projects that all anticipated activities on the Forest, including forest management, recreation, road construction, and mineral development are expected to have a negligible effect on soil productivity. The private parcel would be developed with a no surface occupancy stipulation within wetlands.

3.6 Wastes, Hazardous or Solid

The Resource Conservation and Recovery Act (RCRA) of 1976 established a comprehensive program for managing hazardous wastes from the time they are produced until their disposal. The EPA regulations define solid wastes as any "discarded materials" subject to a number of exclusions. On January 6, 1988, EPA determined that oil and gas exploration, development and production wastes would not be regulated as hazardous wastes under the RCRA. The Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980, deals with the release (spillage, leaking dumping, accumulation, etc.), or threat of a release of hazardous substances into the environment. Therefore, despite many oil and gas constituent wastes being exempt from hazardous waste regulations under RCRA, certain exempt contaminants could be subject to regulations as a hazardous substance under CERCLA.

Environmental Setting

No hazardous or solid waste disposal sites were found in a review of the EPA Envirofacts (USEPA, 2018a) webpage conducted on March 23, 2018. This information was confirmed in subsequent discussions with HMNF staff.

Environmental Effects

While the act of leasing federal minerals would produce no impacts on the environment from hazardous or solid wastes, subsequent exploration and development of the proposed lease could result in the generation and temporary storage of waste materials (solid and liquid). Waste materials would be managed in accordance with BLM Onshore Orders 1 & 7, RCRA, and applicable MDEQ rules and regulations. Fluid handling would be evaluated at the minerals development stage and fluids associated with any subsequent drilling, completion and/or production would either be treated, evaporated, or transferred to an approved MDEQ treatment facility. Solid wastes would be treated on site or transferred to a MDEQ approved facility.

Development of a lease would typically generate the following wastes: (1) discharge of drilling fluids and cuttings into the reserve pits (if pits are used); (2) wastes generated from used lubrication oils, hydraulic fluids, and other fluids used during production of oil and gas, some of which may be characteristic or listed hazardous waste; and (3) service company wastes from exploration and production activities as well as containment of some general trash. Certain wastes unique to the exploration, development, and production of crude oil and natural gas have been exempted from Federal Regulations as hazardous waste under Subtitle C of the RCRA of 1976. The exempted waste must be

intrinsic to exploration, development or production activities and cannot be generated as part of a transportation or manufacturing operation. The drilling fluids, drill cuttings, and produced waters are classified as a RCRA exempt waste, and potential drilling that could occur would not introduce hazardous substances into the environment if they are managed and disposed of properly under federal, state, and local waste management regulations and guidelines. Properly used, stored, and disposed of hazardous and non-hazardous substances greatly decreases the potential for any impact on any environmental resources. Operators and the BLM can ensure hazardous and non-hazardous substances are properly managed through the preparation of a SPCC plan.

In hydraulic fracturing, chemical substances other than water make up a small percentage of the fluid composition; however, the very large volumes used require correspondingly larger volumes of a variety of compounds. These substances range from the relatively benign to the highly toxic at certain concentrations. In addition to these added chemicals, naturally occurring toxicants such as heavy metals, volatile organics, and radioactive compounds are mobilized during extraction and return to the surface with the produced water. Of the millions of gallons of water used to hydraulically fracture a well one time, less than 30% to more than 70% may remain underground (Bamberger and Oswald 2012). Although the risk is low, the potential exists for unplanned releases that could have serious effects on human health and environment. A number of chemical additives are used that could be hazardous, but are safe when properly handled according to requirements and long-standing industry practices. In addition, many of these additives are common chemicals that people regularly encounter in everyday life, such as household disinfectant, detergents, and cosmetics (Ground Water Protection Council & ALL Consulting, 2009).

Surface spills of drilling mud and additives, hydraulic fracturing fluids and additives, flowback water, and other produced water can happen at a variety of points in the development and production phases. Spills that occur can span a range of different spill sizes and causes of failure at any point in the process. For example, small spills often happen as the result of poor pipe connections or leaks; large spills sometimes occur as the result of a major well blowout, but such blowouts rarely occur. Additionally, spills from some phases of development may be the result of human error (i.e. vehicle collisions, improper handling, improper equipment operation or installation, etc.), while others stem from equipment failure (i.e. broken pipes, torn pit liners, leading tanks, etc.) or acts of nature (Fletcher, 2012). The most common cause of spills comes from equipment failure and corrosion (Wenzel, 2012).

The cause of the spill, the spill size, the hazard rating of the spilled material, response time to clean up the spill and the effectiveness of the cleanup, all play a critical role in determining the overall impact on the environment. The volume of a spill can significantly vary with spill types. Pipe spills are not expected to release more than 1,000 gallons into the environment, retaining pit spills and truck spills are not expected to release more than 10,000 gallons of fluid, and blowouts are expected to cause the largest spills, with the potential to release tens of thousands of gallons into the environment. Small spills occur with greater frequency than large spills. Secondary containment or recovery for small spills would likely minimize, if not eliminate, any potential release into the environment. However, for spills of several thousands of gallons of fluid, it is expected that less than half the fluid may be captured by secondary containment or recovery. The vast majority of operations do not incur reportable spills (5 gallons or more), indicating that the fluid management process can be, and usually is, managed safely and effectively (Fletcher 2012).

Several common practices would be implemented to reduce the risk of contamination from waste materials. For example, all trash would be placed in a portable trash cage and hauled to an approved landfill, with no burial or burning of trash permitted. Chemical toilets would be provided for human waste. Fresh water zones encountered during drilling operations would be isolated by using casing and cementing procedures. A berm or dike would enclose all production facilities if a well is productive, and all waste from all waste streams on site would be removed to an approved disposal site. Future development activities on these lease sale parcels would be regulated under the RCRA, Subtitle C regulations. Additionally, waste management requirements are included in the 12-point surface use plan and the 9-point drilling plan required for all APDs. Leaseholders proposing development would be required to have approved SPCC plans, if the applicable requirements of 40 C.F.R. §112 are met, and comply with all requirements for reporting of undesirable events. Lease bonds would not be released until all facilities have been removed, wells are plugged, and satisfactory reclamation has occurred

The BLM would apply Conditions of Approval (COAs) in conjunction with the Forest Service at the APD stage regarding handling and disposing of wastes based on what the operator proposes at that time.

As noted in the Proposed Action description, impacts from waste storage, handling, and disposal would be minimized through the use of implementation of BMPs in the application and through COAs at the APD stage along with Federal and State rules and regulations. Other mineral development, agriculture, and timber management activities in

the area would need to comply with all required laws and regulations with regard to wastes. Additional mineral development on federal and private land may lead to an increase in waste storage and disposal facilities which may occur on or off site. However, adherence to required laws and regulations and best management practices, would mitigate the potential for significant adverse cumulative effects.

3.7 Cultural Resources and Paleontology

A cultural resource is a location of human activity, occupation, or use identifiable through field inventory, historical documentation, or oral evidence. Cultural resources include both historic and prehistoric archaeological sites, structures, places of architectural significance, locations with important public and scientific uses, and may include traditional cultural properties, which are definite locations of traditional and or cultural importance to specific social and or cultural groups. Cultural resources include but are not limited to the following types: prehistoric archaeological resource, ethnographic resource, and historic-period archaeological and built environment resources. Cultural resources may be, but are not necessarily eligible, for the National Register of Historic Places (NRHP).

Environmental Setting

The BLM contacted the Michigan SHPO by email dated February 14, 2018 and sent locational information, a map, and an explanation of the EOI process. Although EOIs are a federal undertaking, they lack the potential to cause effects to historic properties under CFR 36 800.3a1, implementing Section 54 of the NHPA.

> [*§ **800.3 Initiation of the section 106 process***.
> *(a) Establish undertaking. The agency official shall determine whether the proposed Federal action is an undertaking as defined in § 800.16(y) and, if so, whether it is a type of activity that has the potential to cause effects on historic properties.*
> *(1) No potential to cause effects. If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency official has no further obligations under section 106 or this part.*]

Potential future actions such as the eventual lease of the property and an APD would trigger Title 54 consultation. To date, the Michigan SHPO has not responded to the

email, indicating that they have found no need to consult at this stage. Consultation would occur at the APD phase prior to ground disturbing activities.

Environmental Effects

There would be no direct impacts to cultural resources/paleontology resulting from the expression of interest as there would be no surface disturbance at this stage. Direct and indirect impacts to cultural resources from potential future oil and gas development may occur if there is ground disturbance. Any known archeological sites within the leasing area, however, would be avoided through conditions of approval to the extent possible in accordance with BLM and Forest Service policy. If future minerals development is proposed (on EOIs 1457 or 1459), the Forest Service, as the surface land manager, would conduct site-specific Section 106 compliance measures including surveys, records search, and the appropriate Tribal and SHPO consultation prior to any ground disturbing activities.

3.8 Native American Religious Concerns

Environmental Setting and Effects

The BLM contacted six federally recognized tribes who have a known connection to the area notifying them of the Proposed Action and asking to identify any concerns with respect to the Proposed Action. The BLM invited the tribes to submit any concerns regarding the proposed leases by email dated February 14, 2018. As of the date of this EA's publication, no tribe has raised a concern.

As discussed above under Section 3.7, the Forest Service, as surface land manager, would conduct the appropriate consultations and site-specific surveys, as needed, prior to any ground-disturbing activities.

3.9 Environmental Justice

Per Executive Order 12898, an environmental justice concern arises if a Federal agency action results in disproportionate high and adverse human health or environmental effects on minority or low-income populations. The CEQ (Council on Environmental Quality, 1997) provides the following criteria for assessing disproportionately high and adverse environmental effects (emphasis added):

"(a) Whether there is or will be an impact on the natural or physical environment ***that significantly*** (as employed by NEPA) ***and adversely affects*** a minority population, low-income population, or Indian tribe. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment; and
(b) Whether environmental effects are significant (as employed by NEPA) and are or may be having an adverse impact on minority populations, low-income populations, or Indian tribes ***that appreciably exceeds or is likely to appreciably exceed those on the general population*** or other appropriate comparison group; and
(c) Whether the environmental effects occur or would occur in a minority population, low-income population, or Indian tribe ***affected by cumulative or multiple adverse exposures*** from environmental hazards."

Environmental Setting and Effects

While the act of expressing an interest in leasing Federal minerals would have no direct effects, subsequent oil and gas development within the Huron-Manistee Units may indirectly result in impacts to people living near potential development sites, including potential low-income populations. Minority environmental justice populations, as defined by CEQ criteria, are not expected. Future exploration, drilling or production could create an inconvenience to people living adjacent to development areas due to increased traffic and traffic delays, as well as light, noise and visual impacts. These impacts would be particularly noticeable in areas where oil and gas development has not occurred previously. The level of inconvenience would depend on the activity affected, traffic patterns within the area, noise levels, the length of time and season in which these activities occurred, and other factors. Creation of new access roads would potentially allow increased public access and exposure of private property to vandalism. For leases in which the surface is privately-owned and the mineral estate is federally-owned, surface owner agreements, standard lease stipulations, and BMPs would potentially address many of the concerns of private surface owners. Although there is potential for future mineral development within the HMNF to affect low-income populations in the area, the level of affect is not expected to be disproportionate and high as defined by CEQ criteria. Therefore, the proposed action is not expected to result in environmental justice concerns.

3.10. Visual Resources

Environmental Setting

Most of the analysis area is in the Rural Management Area, which is characterized in the 2006 Forest Plan by a high presence of cleared utility rights-of-way and oil and gas development. A small portion of the analysis area is in the Wild and Scenic Study Rivers Management Area, and the private lands are not in any Management Area under the Forest Plan. These private lands are composed of row crops, pastures, residences, and woodlands.

The Forest Plan describes and classifies lands according to their *scenic attractiveness* and *scenic integrity* and *scenic integrity objectives*. Scenic quality is visual diversity, created primarily by topography and landform diversity. Scenic integrity refers to the degree of modification of a landscape from a state that is largely untouched by human development; low scenic integrity applies to landscapes that are heavily modified by developments like roads, artificial clearings, and buildings. Scenic integrity objective represents the Forest Service's desired future condition as it relates to scenic integrity.

Most of the HMNF lands within the Rural Management Area are classified as indistinctive (Class C), the low end of the scale for scenic attractiveness. Likewise, due to the high density of roads, cleared rights-of-way, agricultural lands, and other artificial structures, most HMNF lands in the Rural Management Area have low long-term scenic integrity objectives, although some of them in areas with high topographic relief or large bodies of water have moderate or high scenic integrity. All of the national forest lands within the Wild and Scenic Study Rivers Management Area have high scenic integrity objectives.

Environmental Effects

There would be no direct impacts on visual resources or scenic quality as a result of leasing as there would be no surface disturbance at the leasing stage; however, subsequent mineral development could result in impacts. Should mineral development occur, land cleared for roads, pipelines, and well pads may reduce an area's scenic integrity. Oil and gas development may retain an area's scenic integrity by utilizing existing clearings for pads, pipelines, and roads, and 2006 Forest Plan standards and guidelines are designed to prevent departure from an area's current scenic integrity according to each area's scenic integrity objective.

Upon completion of drilling and completion operations the well pad, pipeline and any areas not necessary for production would be placed into interim reclamation further reducing the footprint and visual impacts of the location.

The potential reduction of scenic integrity of the lands affected by oil and gas development is part of a larger trend of management of the Manistee National Forest toward open or early-successional habitat, largely for the purpose of supporting the recovery of the endangered Kirtland's warbler. While oil and gas development may account for clearings of a few acres and a total impact of tens or scores of acres, the 2006 Forest Plan prescribes creation of openings of up to 550 acres, totaling over 100,000 acres.

3.11. Socioeconomics

Environmental Setting

Leasing would produce various connected effects from the creation of jobs. Jobs in oil and gas extraction (NAICS 211) and support services for mining, including oil and gas (NAICS 213) provide thousands of full-time-equivalent jobs in Michigan, concentrated in cities that are close to the oil and gas resources, including the north-central portion of the Lower Peninsula (Zullo and Zhang, 2013, p. 6). These jobs, especially production jobs (as opposed to support services) typically pay wages above the median income for Michigan.

Environmental Effects

The direct effect of leasing would be the payments, if any, received by the Federal Government from the leasing of the proposed parcels in the HMNF. Federal oil and gas leases generate revenue through initial bids as well as annual rents. The minimum competitive lease bid is $2.00 per acre. Lease rental costs $1.50 per acre per year for the first five years and $2.00 per acre per year thereafter. Oil and gas leases expire after 10 years unless they are producing, under which circumstance they last for the duration of production. Annual lease rents continue until production begins, at which point rents are replaced by royalties, which are set at 12.5% of production revenue.

The federal government supports counties with federal land through reimbursements for highway construction, law enforcement, and fire protection and through rural development grants, but the three primary sources of compensation to the states and counties are the 25 Percent Fund, payments in lieu of taxes (PILT), and mineral royalties.

Through the 25 Percent Fund, the federal government pays to the states 25% of the fees collected from timber harvests, camping, grazing, and special use permits. These funds are transferred to the counties based on their proportions of federal land ownership. These payments peaked in the mid-1980s and declined precipitously after that due to a nationwide decline in timber harvesting. PILT is made by the federal government to counties based on each county's proportion of federal lands that were acquired from private owners and several other indicators. Finally, mineral royalties have been paid at the rate of 25%. There have been many changes through the years to the payment programs described above. Table 5, below, summarizes payments made by the federal government to Muskegon, Newaygo, and Oceana Counties. *These figures are not adjusted for inflation and are not directly comparable across years.*

Table 5. Federal government payments to counties.

	Muskegon	Newaygo	Oceana		Muskegon	Newaygo	Oceana
2006	$10,872	$96,153	$46,223	2011	$8,000	$225,216	$34,011
2007	$4,030	$35,760	$17.133	2012	$6,855	$201,950	$29,142
2008	$8,474	$275,920	$36,011	2013	$5,992	$195,001	$25,498
2009	$7,993	$261,067	$33,974	2015	$5,648	$172,275	$24,062
2010	$8,044	$245,414	$34,196				

Source: Payments and Receipts, https://www.fs.usda.gov/main/pts/securepayments/projectedpayments

3.12. Recreation

Environmental Setting

Different types of recreational use occur in different locations across the analysis area. The many miles of motorized trails are used by off-road vehicles. The Muskegon and White Rivers are used by paddlers, and the roads are used for people out for a pleasure drive. There is a campground within the analysis area, associated with the Diamond Point Recreation Area, which is entirely within the Wild and Scenic Study Rivers Management Area.

Environmental Effects

There would be no direct impacts from leasing, since there would be no ground disturbance at this stage. Subsequent minerals development, such as well construction, operation, and, eventually, abandonment would have various types of impacts on recreational use, ranging from producing physical barriers that preclude certain types of use to modifying the environment in ways that make an area less desirable for recreational use. Road construction and use by heavy equipment and other large vehicles may result in temporary restrictions or rerouting of roads. Construction and drilling activities would generate noise and change views in ways that could make the area less attractive to people who desire solitude and natural surroundings.

Forest Plan standards prohibit surface occupancy in developed recreation areas and trails. Development may be permitted on a case-by-case basis in the Wild and Scenic Study Rivers Management Area. Impacts to recreational uses of private lands, in the case of development on private surface, would be subject to the terms of the agreement between the operator and the private surface owner.

Potential development is expected to have no impact on paddling, since Forest Plan standards and guidelines prohibit almost all development within both the Wild and Scenic Study Rivers Management Area and developed recreation sites, such as boat launches.

3.13. Noise

Environmental Setting

The analysis area within the national forest is frequented by off-road recreational vehicles for enjoyment, hunting, and camping. There are also rural housing developments near some of the parcels.

Environmental Effects

There would be no direct noise impacts from leasing, since there would be no ground disturbance at this stage. However, subsequent mineral development activities could generate noise that could disrupt or negatively impact recreational users and wildlife species sensitive to sound disturbances within a proximity of the proposed action during construction, drilling and completion operations. The proximity of disturbance would not just depend on species, but individuals within a species. Vegetation types and density have an effect by dampening the noise. The areas proposed are mostly forested lands and noise associated with development would not be carried as far as on an open prairie.

Once the wells are placed into production noise on the location would be greatly reduced with the operator making daily to weekly visits and infrequent workover operations that would result in much less noise disturbance that would likely result in no further disturbance beyond the existing ATV/UTV/OHV use in the area.

The BLM may recommend the use of BMPs, such as sound barriers, blankets, or mufflers to protect sensitive species that may be affected by noise or may require the operator to monitor species of concern. If a threatened or endangered species or migratory bird species of concern is likely to be affected, then seasonal and timing restrictions would be implemented.

4. Persons, Groups, and Agencies Consulted

Name	Title	Responsible for the Following Section(s) of this Document
Derek Strohl	Natural Resources Specialist	Air Resources; Noise and Odor; Vegetation Resources; Forests; Transportation and Access; Water Resources; Socioeconomics
Stan Plum	Archaeologist/Tribal Liaison	Cultural Resources; Native American Religious Concerns; Environmental Justice; Tribal Consultations
Kyle Schumacher	Natural Resources Specialist	Wildlife Resources; Soils, Wastes
Carolyn Helm	Geologist	Geology, Mineral Resources and Energy Production
Kurt Wadzinski	Planning & Environmental Coordinator	Editor/Reviewer
Stephanie Carman	Assistant District Manager, Natural Resources	Editor/Reviewer

Federal Agencies:
U.S. Fish and Wildlife Service - Michigan Ecological Services Field Office
Huron-Manistee National Forest

Tribes:
Pokagon Band of Potawatomi Indians
Little River Band of Ottawa Indians
Sault Ste. Marie Tribe of Chippewa Indians
Saginaw Band of Chippewa Indians
Lac Vieux Desert Band of Lake Superior Chippewa Indians
Bay Mills Indian Community

State Agencies:
Michigan State Historic Preservation Office

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6. Appendices

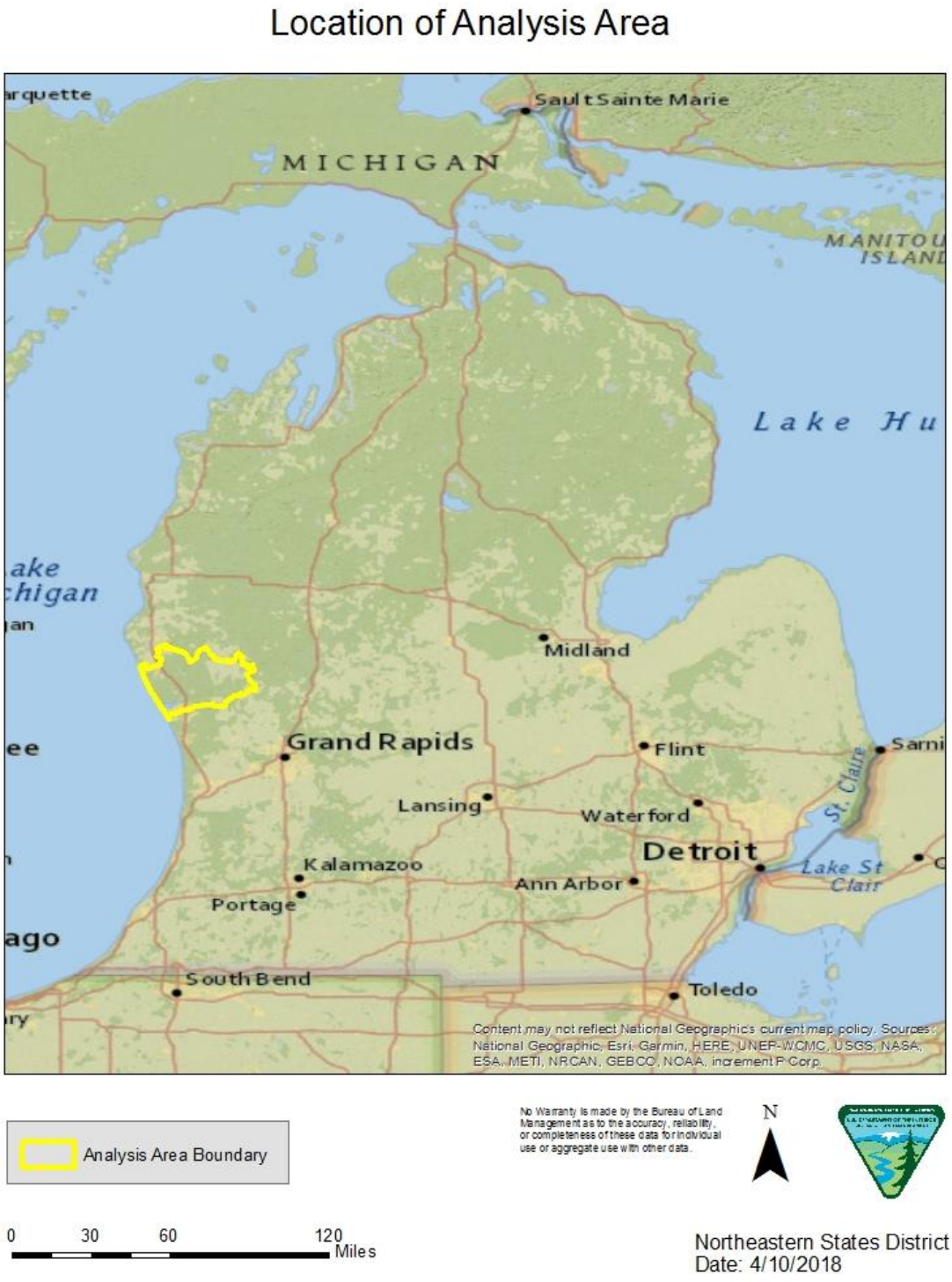
Appendix A: Legal Land Descriptions for Proposed Parcels with Applicable Notices and Stipulations

PARCEL	LEGAL LAND DESCRIPTION WITH APPLICABLE NOTICES/STIPULATIONS
FS Parcel #1 **EOI-1457(1)**	Michigan, Muskegon County, Manistee NF T. 11 N., R. 15 W., Michigan Meridian Sec. 3, S2NW, SWNE Sec. 4, W2, NESE Sec. 5, E2, E2NW Sec. 9, NE, N2NW 1126.82 Acres Subject to: Forest Service Standard Lease Stipulations Lease Notices #1, #2, #3, #5, #6, #10, #11 Lease Stipulations #1, #2, #19 or #21 (no surface occupancy) applies to all lands in Sec. 4, Sec. 5, and Sec. 9 Lease Stipulation #9 applies to all lands Lease Stipulation #25 applies to all lands in Sec. 9
FS Parcel #2 **EOI-1457(2)**	Michigan, Muskegon County, Manistee NF T. 11 N., R. 15 W., Michigan Meridian Sec. 7, E2SE, E2SWSE Sec. 8, NWNE, SENE, W2SW, SWSE, N2SE, NESW Sec. 16, N2NW Sec. 17, All Sec. 18, E2SW, E2E2, SENW, NWSE, E2SWSE 1480.00 Acres Subject to: Forest Service Standard Lease Stipulations Lease Notices #1, #2, #3, #5, #10, #11 Lease Notice #6 applies to lands in Sec. 18 Lease Stipulations #1, #2, or #21 (no surface occupancy) applies to Sec. 8, SWNWNE, Pt. NWNWSE, NESW; Sec. 16, Pt. NWNENW, Pt. NENWNW; Sec. 17 Pt. SWNE, Pt. NESW, W2SW, Pt. W2NW, Pt. NENW; Sec. 18, all lands Lease Stipulation #9 applies to all lands Lease Stipulation #25 applies to all lands in Sec. 16

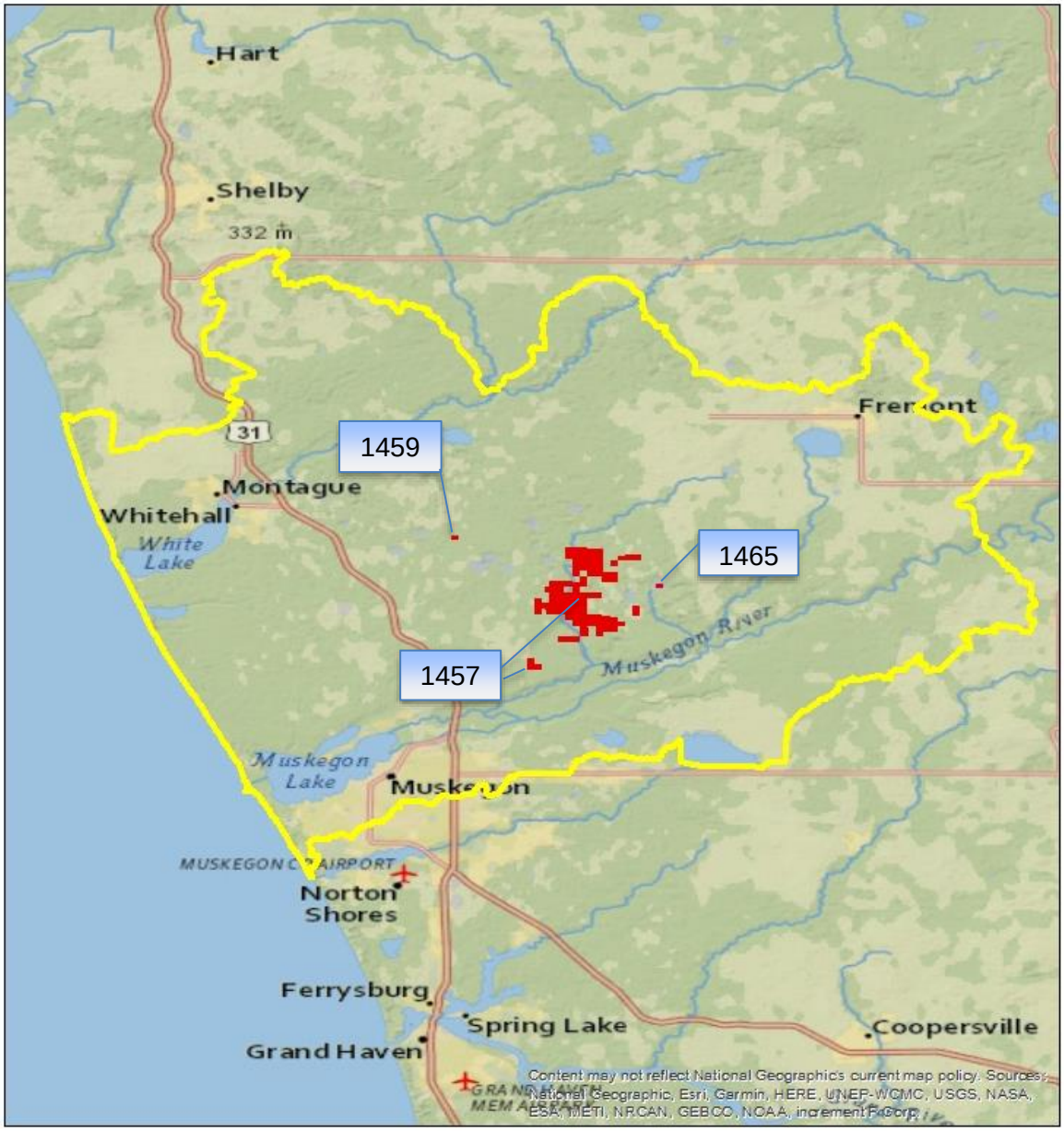
PARCEL	LEGAL LAND DESCRIPTION WITH APPLICABLE NOTICES/STIPULATIONS
FS Parcel #3 EOI-1457(3)	Michigan, Muskegon County, Manistee NF T. 11 N., R. 15 W., Michigan Meridian Sec. 15, W2SE 80.00 Acres Subject to: Forest Service Standard Lease Stipulations Lease Notices #1, #2, #3, #5, #6, #10 Lease Stipulation #9 applies to all lands Lease Stipulation #25 applies to all lands in Sec. 15
FS Parcel #4 EOI-1457(4)	Michigan, Muskegon County, Manistee NF T. 11 N., R. 15 W., Michigan Meridian Sec. 20, E2SE, NENW, NE Sec. 21, S2NE, NW, E2SW, N2SE, S396' E2NENE exc. N132' of E660', NWNE exc. S132' of N528' of E660' Sec. 22, SWNW Sec. 29, NWNE, N2NW 888.00 Acres Subject to: Forest Service Standard Lease Stipulations Lease Notices #1, #2, #3, #5, #10 Lease Notice #6 applies to Sec. 21, Sec. 22 Lease Stipulations #1, #2, or #21 (no surface occupancy) applies to Sec. 20, Pt. W2SESE; Sec. 21, all lands, Sec. 29, E2NWNE Lease Stipulation #9 applies to all lands

PARCEL	LEGAL LAND DESCRIPTION WITH APPLICABLE NOTICES/STIPULATIONS
FS Parcel #5 EOI-1457(5)	Michigan, Muskegon County, Manistee NF T. 11 N., R. 15 W., Michigan Meridian Sec. 31, NWNW, Pt. S2NW exc. S27 rods of E131 rods of W143 rods (22.1 ac.) 102.78 Acres Subject to: Forest Service Standard Lease Stipulations Lease Notices #1, #2, #3, #5, #10 Lease Stipulation #9 applies to all lands
FS Parcel #6 EOI-1459	Michigan, Muskegon County, Manistee NF T. 12 N., R. 16 W., Michigan Meridian Sec. 34, NWSE 40.00 Acres Subject to: Forest Service Standard Lease Stipulations Lease Notices #1, #2, #3, #5, #10 Lease Stipulation #2 (no surface occupancy) applies to Pt. NWSWNWSE Lease Stipulation #9 applies to all lands
EOI-1465/1514	Michigan, Muskegon County T. 11 N., R. 15 W., Michigan Meridian Sec. 11, NESW 40.00 Acres Subject to: Private surface stipulation: No surface occupancy is permitted within wetlands. The BLM would grant a waiver to this stipulation for wetland activities for which the operator has obtained the necessary state and federal permits.

Appendix B: Maps



Parcels Proposed for Oil and Gas Leasing



Proposed Lease Parcels

Analysis Area Boundary

0 4 8 16 Miles

No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

N

Northeastern States District
Date: 4/13/2018

Appendix C: Lease-Specific Oil and Gas Notifications and Stipulations

Lease notices are notifications of requirements that will apply to drilling. Their purpose is to draw attention to existing policies. Stipulations are restrictions on a lessee's right to access Federal minerals, such as prohibitions on using a portion of a parcel in order to protect a sensitive resource.

Huron-Manistee National Forests

Lease Notices

Lease Notice #1) Operations under this lease will be consistent with the Standards and Guidelines found in the Huron-Manistee National Forests Land and Resource Management Plan and hereby incorporated into this lease in their entirety.

Lease Notice #2) Surface disturbance will be limited to that necessary for reasonable, safe and prudent extraction of the oil and gas. Measures will be implemented to minimize erosion and sedimentation. Road and stream crossings will be planned to eliminate stream crossings whenever practical.

Lease Notice #3) Processing of proposed surface use plans of operation on National Forest System lands includes site-specific analysis to determine effects to threatened, endangered, or sensitive species. This analysis may require surveys for certain plants and/or animals. Depending upon the species of concern, it may be necessary to survey through spring, summer, and fall. The extent of required surveys could delay permit issuance. Operators are encouraged to submit proposals as soon as possible to facilitate the scheduling of necessary survey work.

Lease Notice #4) All or portions of this lease parcel is located in Management Area 4.2, Roaded Natural Sandy Plains and Hills (Huron-Manistee National Forests Land and Resource Management Plan). A reclamation plan for all wells, pipelines, production facilities and access routes must be submitted to the Forest Line Officer in charge for approval. Disturbed areas will be restored after completion of drilling and/or production operations. Permanent vegetative cover will consist of a mixture of native warm season grasses. These will be scheduled for establishment just prior to the next growing season, generally late April, May or early June.

Lease Notice #5) Lands included in this lease parcel are being managed as a wildlife emphasis area or Karner blue butterfly management unit and occupancy is subject to more restrictive controls than routine areas.

Lease Notice #6) Portions of this lease parcel have had occurrences of certain threatened, endangered, or sensitive species or communities. At the time a drilling permit application or other request for surface use is filed, a site-specific review will be done to determine potential effects to these species. Depending upon the findings of the site-specific review, additional

operating constraints, such as seasonal restrictions or re-location of the proposed wellsite, may be necessary to mitigate effects to threatened, endangered, or sensitive species or communities.

Lease Notice #7) Portions of this lease parcel contain known heritage resource sites. At the time a drilling permit application or other request for surface use is filed, a site-specific review will be done to determine potential effects to these sites. Depending upon the findings of the site-specific review, additional operating constraints, such as re-location of the proposed wellsite, may be necessary to mitigate effects to heritage resources.

Lease Notice #8) A portion of this lease parcel is in an area proposed for timber harvest activities. If oil and gas activities and timber harvesting are proposed concurrently, use conflicts between the oil and gas operator and timber purchaser would need to be resolved prior to issuance of a Federal drilling permit.

Lease Notice #9) Parcel is surrounded entirely by private land and access must be negotiated with adjacent landowners.

Lease Notice #10) This lease parcel is located in an area considered to be habitat for the northern long-eared bat (*Myotis septentrionalis*). At the time a drilling permit application or other request for surface use is filed, a site-specific review will be conducted and potential impacts to this species will be assessed. Depending upon the findings of the site-specific review, additional operating constraints, such as a seasonal restriction on tree felling, may be necessary to mitigate adverse effects.

Lease Notice #11) This lease parcel is located in an area considered to be habitat for the eastern massasauga rattlesnake (*Sistrurus catenatus*). At the time a drilling permit application or other request for surface use is filed, a site-specific review will be conducted and potential impacts to this species will be assessed. Depending upon the findings of the site-specific review, additional operating constraints, such as re-location of the proposed wellsite or seasonal operating restrictions, may be necessary to mitigate adverse effects.

Lease Stipulations

The "USDA - Forest Service Standard Stipulations - Lease" below applies to all proposed lease parcels EXCEPT for EOI-1465/1514.

USDA- FOREST SERVICE
STANDARD STIPULATIONS – LEASE
(FSM 2820)

Serial No.: _EOI_____
Lessee: _____
National Forest: Huron-Manistee NF_____

The lessee is notified and agrees:

All work and any operations authorized under this permit shall be done according to an approved operating plan on file with the Forest Supervisor at 1755 S. Mitchell St. Cadillac, MI 49601. Plans generally require a minimum of 45 days for Forest Service review. Bureau of Land Management must also review and also approve.

Operating plan will contain information the Forest Officer determines reasonable for assessment of (1) public safety, (2) environmental damage, and (3) protection for surface resources. Content of such plans will vary according to location and type of activity and may contain:

1. Steps taken to provide public safety.
2. Location and extent of areas to be occupied during operations.
3. Operation methods including size and type of equipment.
4. Capacity, character, standards of construction and size of all structures and facilities to be built.
5. Location and size of areas where vegetation will be destroyed or soil lay bare.
6. Steps taken to prevent and control soil erosion.
7. Steps taken to prevent water pollution.
8. Character, amount, and time of use of explosives or fire, including safety precautions during their use.
9. Program proposed for rehabilitation and revegetation of disturbed land.

Copies of all permits obtained from State or Federal agencies pertaining to work might be required. Archeological studies, if required, will accompany plan.

The Forest Supervisor or his/her designated agent has authority to temporarily suspend or modify operations in whole or in part due to emergency forest conditions such as high fire danger or other unsafe situations.

The lessee must keep the Authorized Officer informed about progress of operations to the extent reasonably necessary for assuring public safety. This is especially important with geophysical inventory and testing activities because of their mobile nature. The Authorized Officer will alert the lessee to circumstances, which may affect safe and efficient conduct of work activities.

Terms of this lease are considered violated if not done according to these stipulations.

See Special Stipulations & Notifications

_____
Lessee

R9-2800-6a (3/83)

Stipulation #1) No surface occupancy is permitted on this parcel within 300 feet, measured at a perpendicular, from the normal high water mark of any river, stream, or lake. If site-specific examination determines that rivers, streams or lakes do not exist on the lease parcel, this stipulation may be waived.

Stipulation #2) No surface occupancy is permitted on this parcel due to the presence of wetlands. If site-specific examination determines that wetlands do not exist on the lease parcel, this stipulation may be waived.

Stipulation #3) All or portions of this lease parcel are located in an area managed as Old Growth. In accordance with the Huron-Manistee National Forests' Forest Plan, no surface occupancy is permitted on this parcel due to the lack of existing reasonable access. If an on-the-ground review of this tract indicates reasonable access does exist, this stipulation may be waived. Any subsequent surface occupancy would be limited to those existing roads and trails.

Stipulation #4) All or portions or this lease parcel are located in an area managed as Old Growth. Surface disturbing activities will take place outside of old growth where there are reasonable alternative locations. Due to the presence of existing reasonable access via roads/trails, surface occupancy is permitted, however, is limited to existing roads and trails.

Stipulation #5) All or portions of this lease parcel are located in an area managed as a semi-primitive nonmotorized area. Production facilities will be located outside the area when practical and needed pumps will be run by electric motors or equipped to minimize noise.

Stipulation #6) This parcel is located in an area managed as a semi-primitive nonmotorized area. The Huron-Manistee National Forests' Forest Plan limits surface location density in these areas. The maximum surface development density in this area is 1 surface location per 640 acres.

Stipulation #7) This parcel is located in an area managed as a semi-primitive nonmotorized area. Roads must use existing transportation corridors when compatible, feasible and practical.

Stipulation #8) This parcel is located within a Wild and Scenic River Corridor. No surface occupancy for oil and gas development will be permitted within this corridor.

Stipulation #9) All or portions of this lease parcel are located in potential Indiana bat habitat. Surface disturbing activities that involve tree removal will be prohibited between May 1 and August 31 if suitable Indiana bat habitat is found to be present. This stipulation may be waived if site-specific review of the proposal determines that suitable habitat is not present.

Stipulation #10) All or portions of this lease parcel are located within a 5-mile radius of Tippy Dam (Indiana bat hibernaculum). No surface occupancy will be permitted on all or portions of

this lease for surface disturbing activities associated with site construction and/or oil and gas drilling between May 1 and October 20. This stipulation may be waived based on site-specific review of the proposal and identification of potential effects on the Indiana bat.

Stipulation #11) The North Country National Scenic Trail runs through all or portions of this lease parcel. No surface occupancy will be permitted for areas within 300 feet, measured at a perpendicular, from each side of the Trail. If site-specific examination determines that the North Country National Scenic Trail is not located on the lease parcel, this stipulation may be waived.

Stipulation #12) All or portions of this lease are located in an area of steep, fragile slopes. No surface occupancy is permitted on identified areas. This stipulation may be waived based on site-specific review of proposed location and soil types.

Stipulation #13) This parcel is located within the corridor of a Study Wild and Scenic River. No surface occupancy for oil and gas development will be permitted within this corridor.

Stipulation #14) All or portions of this lease are located near the River Road National Scenic Byway. No surface occupancy is permitted within 300 feet of the Byway.

Stipulation #15) All or portions of this lease are located in areas managed as Kirtland's warbler essential habitat. Surface location density restrictions as outlined below will apply in these areas:

Age of Essential Habitat	**Maximum Development Density**
0 to 25 years	1 surface location per 640 acres
26 to 40 years	1 surface location per 160 acres
Older than 40 years old	1 surface location per 640 acres

The priority for identifying surface locations are: 1) First priority will be stands (or inclusions of stands) that are not biologically appropriate for the development of breeding habitat for Kirtland's warbler, 2) Second priority will be stands within essential habitat that are greater than 26 years old, and 3) Third priority will be stands within essential habitat that are 0 to 25 years old. Exceptions may be granted through consultation with the Forest Service and the U.S. Fish and Wildlife Service.

No drilling, exploration, construction or maintenance involving the use of heavy equipment shall take place within one-half mile of or create noise greater than 85 decibels in occupied habitat, between May 1 and September 30. In occupied habitat, proven wells can be operated between October 1 and April 30, but between May 1 and September 30 only if they are flowing or operated by bottom-hole pump and 1) the product is transported by buried pipeline; 2) collection and storage facilities are located off essential habitat where reasonable; 3) noise from production operations will be less than 85 decibels at 100 feet, and 4) access is limited to routine monitoring of the well.

Stipulation #16) All or portions of this lease are located in an area designated as a Research Natural Area. No surface occupancy for oil and gas development is permitted in areas so designated.

Stipulation #17) All or portions of this lease are located in an area designated as a Candidate Research Natural Area. No surface occupancy for oil and gas development is permitted in areas so designated.

Stipulation #18) A portion of this lease tract includes a Forest administrative site. No surface occupancy for oil and gas development will be permitted in this area.

Stipulation #19) A portion of this lease tract includes a Forest developed recreation site. No surface occupancy for oil and gas development will be permitted in this area.

Stipulation #20) A portion of this lease tract is involved in the North American Long-Term Soil Productivity Study. Until completion of this study, no surface occupancy will be permitted on those portions of the lease tract that are included in this study.

Stipulation #21) This parcel contains lands designated as occupied Karner blue butterfly habitat. No surface occupancy for oil and gas development is permitted in areas so designated.

Stipulation #22) This parcel is located in an area managed as a semi-primitive motorized area. The Huron-Manistee National Forests' Forest Plan limits surface location density in these areas. The maximum surface development density in this area is 1 surface location per 160 acres. Production facilities will be located outside the area when practical and needed pumps will be run by electric motors or equipped to minimize noise.

Stipulation #23) This parcel is located in an area managed as a Special Area or contains sensitive communities. No surface occupancy for oil and gas development is permitted in areas so designated.

Stipulation #24) No surface occupancy will be permitted for areas within 300 feet, measured at a perpendicular, from each side of existing and/or planned Visual Sensitivity Level 1 trails within the lease parcel. In areas with a high concentration of trails, this may preclude occupancy on the entire parcel.

Stipulation #25) This parcel contains lands identified as eastern massasauga rattlesnake habitat. No surface occupancy for oil and gas development is permitted in areas so designated. Exceptions may be granted through consultation with the Forest Service and the U.S. Fish and Wildlife Service.

Lease Notices and Lease Stipulations For EOI 1465 (Private Surface)

Lease Stipulations

No surface occupancy is permitted within wetlands. The BLM would grant a waiver where the operator is able to obtain all required state and federal permits along with landowner approval.